CHAPTER I

INTRODUCTION

1.1 Preamble

The strength and durability of road pavement depends on several factor such as the strength of subgrade, the repeated loading applied from traffic, and the design itself. The amount of voids in a Hot Mix Asphalt (HMA) mixture is probably the single most important factor that affects performance of the mixture throughout the life of the pavement (Roberts *et al.*, 1996). Peterson (1982) stated that the desired air void content for initial in-place voids for dense graded mixtures should not be higher than approximately 8% and should never less than approximately 3% during the life of the pavement.

High air void contents allow water and air to penetrate into the structure resulting in water damage, oxidation, raveling and cracking. Meanwhile low air void contents lead to rutting and shoving of asphalt mixtures. One of the variables that affected by the air void content is permeability. The higher the air voids the higher the permeability, and vice-versa.

1.2 Problem Statement

High in-place air voids have been identified as the cause of cracking and stripping problems of hot mix asphalts (HMA) pavements. It was caused by inadequate compaction which permits the entrance of water and air into the permeable HMA pavement (Kumar and Goetz, 1977). For fine dense graded mixes, pavements with air void contents more than 8% are generally prone to permeability problem (Brown, 1990) and for coarse dense graded mixes air void contents more than 6% could result in permeable pavements (Cooley, Prowell and Brown, 2002).

To date, there has been a limited research conducted to investigate the permeability characteristics of our HMA dense graded mixes. Thus, there is a need to conduct an experiment to evaluate the permeability characteristics and determine the desirable density levels for impermeable pavement.

1.3 Objectives of the Study

This study is conducted to achieve several objectives. The objectives of this study are to:

i. evaluate permeability characteristics of local HMA mixtures;
ii. establish relationships between air void and permeability of local HMA mixtures; and
iii. obtain better minimum in-situ density levels in order to achieve impermeable pavements.

1.4 Scope of the Study

HMA mixtures will be compacted in the laboratory to the in-situ density levels for each mix type as stipulated in the JKR specifications. Laboratory permeability test will be performed on each sample from each mix type. These include ACW14, ACW20, BMW14, BMW20, ACB28, BMB28, BMR28, and BML10. If the samples are found to be permeable, the compactive effort will be increased until the desired density level is achieved. The entire test will be conducted at Makmal Pengangkutan, UTM Skudai.

1.5 Significant of Study

From the result of the study, the relationship between air void and permeability will be established. Then, the maximum air void content will be determined from the relationship according to the suitable permeability values. If the new air void content was found to affect the density levels of the pavement provided in JKR/SPJ/1988 (JKR, 1988), it is propose that the permeability factors should be taken into consideration in designing the road pavement. The density level of the road pavement can be determined by the maximum value of air void content obtained from this study.

From this study, the problem such as rutting, stripping, raveling and cracking will be prevented as result from better design with optimum air void contents. The problem caused by permeability will be reduced thus providing more durable and stronger pavement.

1.6 Summary

This chapter overview the background HMA problem as related to permeability. Next chapter will discuss the background of the HMA materials, mixture design, construction and their properties focuses on permeability in detail.